

“Form and Design” for India

Achyut Kanvinde's Reflection on Louis Kahn

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Abstract

Amongst documents stored at Achyut Kanvinde's Delhi office, a box file holds a thick batch of the architect's written commentaries and essays. One of India's most significant and prolific modernists, Kanvinde's design speculations and built work were sporadically complemented with writings. Of the set of articles dated to the culminating years of his working life, a nine page, unpublished manuscript entitled, “Form and Design: Milk Processing Plants”, (1991) describes his approach to the design of milk factory buildings. As the lead title “Form and Design” registers, it is with a quotation of Louis Kahn's terms of reference that Kanvinde begins. Within literature on Kanvinde, Kahn's influence is consistently highlighted with many of Kanvinde's best known buildings read in terms of Kahnian tropes and strategies. Despite such explicit association however, Kanvinde's adjustment of Kahn's approach to local particularities remains understudied. Through a close and synthesised reading of Kahn and Kanvinde's “Form and Design” essays, written three decades apart, this paper reflects on their respective architectural priorities, as they align and deviate. The paper will argue that Kanvinde's reiteration of “Form” and “Design” translates Kahn's creative process to a framework for cultural localisation and a method by which an iconic architectural image for independent India is made manifest.

Introduction

Achyut Kanvinde's (1916–2002) contribution to the emergence and evolution of modern architecture in India has been typically framed in terms of a relatively direct transfer of modernist tenets to the Indian context.¹ From his Bauhaus inspired early work to the brutalist institutional projects of 60s and 70s, he negotiated a spectrum of disciplinary priorities relative to India's nation-building agenda; beginning in the immediate post-independence years and spanning over five decades to the close of twentieth century. Credited with the design and realisation of over one-hundred projects, his substantial achievements have been noted by scholars and architects alike, focusing for the most part on his built works and associated influences.² The discovery and close reading of the "Form and Design: Milk Processing Plants" (1991) offers a new opening for the consideration of Kanvinde's work via an emphasis on his design process.³ Focused on the milk factory program, a building type associated with the India's national dairy initiative, the essay deploys the Kahnian terms "Form" and "Design" within a highly charged post-independence political movement. Through a close reading of the two "Form and Design" essays, the paper reflects on Kanvinde's adaptation of international disciplinary themes to the Indian context.

Kanvinde's Writings: Advocacy and Method

In contemporary consideration of Kanvinde's career, his written work remains relatively unexamined.⁴ This is perhaps due to lack of an organised archive and access to his manuscripts. Over the course of his career, Kanvinde complemented his built work with written considerations, consisting of lecture notes, formal addresses, essays, short articles, transcribed interviews.⁵ Among these the relatively early written speculations, for example, the *Seminar on Architecture* (1959) and *Campus Design in India: Experience of a Developing Nation* (1969) remain the most dominant reference points, with his later statements less studied.⁶ Although sporadic and typically short in length, Kanvinde's writings and interviews from the 1970s onwards were typically prepared in context of representative roles within government and professional institutions.⁷ They thus offer an important register of his position as both an architect and architectural advocate.

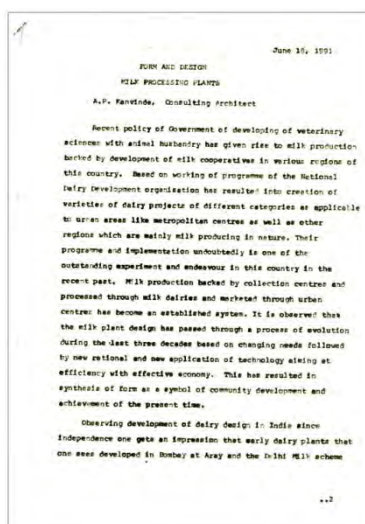


Figure 1. Kanvinde, "Form and Design: Milk Processing Plants", title page. [Kanvinde Article File, 2].

In later years, Kanvinde's vigorous advocacy is matched by retrospective accounts of his career. Essays penned after the 1990s in particular, assume a more reflective character and offer insights into his working method.⁸ A dominant framework in these late considerations is the role of specific architectural types in the nation-building effort. Libraries, hospitals, and public housing, for instance, were subject to independent considerations, each building type scrutinized for its significance and political agency. Dated June 16, 1991 Kanvinde's "Form and Design" essay extends this typological

focus to an investigation of the milk processing factory. Beginning with the design of Dudhsagar Dairy at Mehsana (1970–73) he repeatedly returned to this project type over the course of two decades, designing over forty-five large scale dairies across India.⁹ As Kanvinde's only comprehensive statement on his approach to the design of milk factory buildings, the essay not only provides a succinct overview on this building type, but his creative process more broadly.

“Form and Design”: Interpreting Kahn

The influence of Louis Kahn (1901–1974) has been a recurring theme in the literature on Kanvinde. With firsthand experience of Kahn's projects during his travels to the US in the 1960s such as his Richards Medical Laboratories at the University of Pennsylvania (1962), Kanvinde's knowledge of Kahn was further enriched through the Indian Institute of Management (IIM) in Ahmedabad (1962–72). Kahn's first project in the Indian subcontinent, the IIM was concurrent with Kanvinde's design for the Indian Institute of Technology, Kanpur (1960–66), and both projects cited as contemporary exemplars of local campus design in Kanvinde's seminal monograph, *Campus Design in India*.¹⁰ Kanvinde's close association with Kahn was reflected in his 1974 authorship of Kahn's obituary for the Indian Institute of Architects' journal.¹¹ Yet despite such layered interactions, the precise nature of Kanvinde's response to Kahn's ideas remains obscure. Where this has been subject to discussion, the emphasis is typically formal with Kahn's Richards Medical Laboratories regarded by scholars as a precursor to Kanvinde's major projects built after the 1970s, beginning with the critically acclaimed Dudhsagar Dairy at Mehsana, Gujarat.¹²

Although Kanvinde did not make any explicit reference to Kahn's “Form and Design” essay, his quotation of the terms is unlikely to have been incidental. By the 1990s Kahn's “Form and Design” was critically well known and interpreted as a cogent explanation of his creative method.¹³ This emphasis was arguably indebted to the eminent American historian Vincent Scully, Kahn's friend and early interpreter of his work. It was as early as 1961, in the first monograph on Kahn that Scully alerted his readers to the significance of the essay. Including “Form and Design” as an appendix to the monograph, he assigned Kahn's self-described design process an equal status to his realized buildings.¹⁴ For Scully, Kahn's “Form”, the ideal or essential architectural proposition was conceived in relation to historical precedents and Kahn's notion of “Design”, offered a coherent explanation as to the process by which architectural works from the past would be adjusted to meet the demands of a contemporary culture.¹⁵

This interpretation would remain a consistent feature of Scully's writings on Kahn developed over three decades and the seminal background against which subsequent scholars worked. Scully's respected status as an ongoing authority on Kahn is for example evident in his advisory role to the 1991 major retrospective *Louis I. Kahn: In the Realm of Architecture*.¹⁶ Commissioned by the Museum of Contemporary Art (MoCA), Los Angeles, the exhibition and associated catalogue were the first comprehensive historical review of Kahn's work since Scully's 1962 *Louis I. Kahn*. Curated by David Brownlee and David De Long, members of faculty at the University of Pennsylvania, the project upheld the core tenets of Scully's argument with interpretive deviations framed as nuanced inflections rather than counter-arguments. Explicitly reiterated here was the significance of “Form and Design” as a clear register of the role of history in Kahn's inventive method, albeit with a typological emphasis. For Brownlee and De Long, Kahn's concept of “Form” implied a search for elemental institutional types, with the ‘ideal image’ for each institution derived from history.

Beyond a direct quotation of the Kahnian terminology, Kanvinde's essay implies thematic parallels. Scully's interpretation of “Form” and “Design” as a process of translation from generic to specific as well as the later scholars' emphasis on the architectural type are particularly resonant.

“Form and Design”: The Search for a Contemporary Institution

Kahn’s formulation of “Form and Design” was developed through several typological examples, as well as reference to his own projects, particularly the First Unitarian Church and School (Rochester, NY, 1959–69). Recalling his discussions with the church congregation, he made note of the initial “Form” diagram and the subsequent “Design” plans that were used to communicate the evolution of the First Unitarian Church and School to the client group.¹⁷ For Jan C. Rowan’s subsequent article “Wanting to Be: The Philadelphia School”, Kahn provided annotated drawings to accompany the account of his method. These represented, in sequence, the conception and development of the First Unitarian Church and School project.¹⁸ Deliberately didactic, the drawings gave a cogent visual expression to his approach. The program of a church, with historically established pattern of use, was thus employed by Kahn to outline a design process by which such traditions and associated human rituals would be referred to and yet reconfigured in light of a contemporary secular culture.

With the subtitle “Milk Processing Plant” Kanvinde’s “Form and Design” reoriented the programmatic lens on an explicitly contemporary and a politically poignant building type, one pertinent to India’s post-independent nation-building project. Evolved in context of the ambitious National Dairy Development Program executed by the Indian government for three decades (1970–1996), milk factory buildings were underpinned by unique conflation of Mahatma Gandhi’s vision of rural reconstruction and Jawaharlal Nehru’s agenda of industrial modernity. The program famously incorporated millions of small scale farmers under the common rubric of cooperative structures. It further introduced a combination of modern technology and infrastructure, competitive marketing techniques and improved animal husbandry practices. This dairy revitalisation program ultimately resulted in a phenomenal rise in indigenous milk production making India the largest milk producing nation in the world. Hailed as the “White Revolution”, the movement gained a potent status as grass roots localised response to the post-independence ambition for social and economic development.¹⁹ Noting the proliferation of this building type as a significant institution within metropolitan as well as regional centres, Kanvinde’s essay emphasised the national dairy development initiative as “undoubtedly ... one of the most outstanding experiment (sic) and endeavour in this country in the recent past”.²⁰ In his view, the state driven integration of rural dairy industry with modern technology of production invested the milk factory with the potential for symbolic resonance. This position was made explicit in the opening paragraph of his essay noting:

It is observed that the milk plant design has passed through a process of evolution during the last three decades based on changing needs followed by new rationale and new application of technology aiming at efficiency with effective economy. This has resulted in synthesis of form as a symbol of community development and achievement of the present time.²¹

If Kahn’s concept for a contemporary church approached classical principles via the modernist tradition, Kanvinde’s emphasis was on the symbolic potential of emergent building types. Where their views coalesced was a mutual emphasis on elevated programs. The milk factory building, viewed in context of Nehru/Gandhi dialectic captured both the progressive aspirations for modernization and the sacred connotation of the ancient milk culture – this was in effect a secular temple.

“Form and Design”: From Generic to Specific

Kahn’s 1961 reflection on the Unitarian Church and School at Rochester was effectively an extension of his earlier proposition for a non-denominational university chapel famously advanced during his 1959 CIAM address.²² Beginning with a deliberately polemical question – “So, what is a chapel really?” – he went on to describe the building type as a central space surrounded by a sequence of discrete and concentric environments: first an ambulatory, next an arcade, then a walled garden. Here depicted was a richly layered, spatially diverse architectural matrix where individual participants could

freely determine their degree of engagement with the program supported at the centre. “The essential thing, you see”, Kahn noted, “is that the chapel is a personal ritual, and that it is not a set ritual, and it is from this that you get the form”.

In his annotated sequence of “Form and Design” diagrams, prepared with reference to the Rochester project, Kahn gave architectural expression to this narrative. In the first “Design” translation of the “Form” diagram, a rectilinear church hall, delineated by four columns and three partition walls, was set at the centre of a twelve-sided polygon. The interstitial space between the two figures was defined as the ambulatory. Overlaid by a regular pattern of interlocking triangles, this generously proportioned, mediating circulatory space appeared sheltered by a geometrically elaborate, undulating roof canopy. The ambulatory and the adjacent corridor were, in turn, connected via openings in the four cardinal directions. When combined, the two pathways determined the measure of distance between the church and the school and, at the same time, provided multiple points of connection and exchange between the two environments. An argument was thus advanced for a centralised composition characterised by both: centred, room-like enclosures arranged in a precisely conceived relationship and a spatial dynamism derived from the multi-axial interconnection between these discrete settings.

As realised, the First Unitarian Church and School lacks the ambulatory space, which Kahn determined to be pertinent to the conceptual coherence of this work. Nonetheless, the project and its representations have remained important to the critical discourse about Kahn’s disciplinary significance. Beginning with Scully, critics broadly concur that Kahn’s contribution to the evolution of modernism during the postwar years was, in part, indebted to his radical transfiguration of ancient and generic prototypes to modern and highly particularised contemporary innovations.

Such transition of generic building type to a specific architectural solution was also at the core of Kanvinde’s reflection, albeit with a shift in emphasis. Rather than a focus on traditional sacred program, Kanvinde underlined a new, and specifically regional, institutional type. For him the translation of generic factory type to a milk factory more specifically had the potential to charge an industrial building type with an elevated symbolism. Kanvinde’s argument was accordingly advanced through a critique of the late colonial and early post-independence milk processing factories. Dismissive of the “utilitarian” and “preconceived arbitrary considerations” of a “normal factory type”, characteristic of Indian dairies he argued for a more contextual response.²³

In resonance with Kahn, Kanvinde’s proposal for localisation was articulated in two parts. This began with a broad “system” based formulation of constitutive architectural components, consisting of structure, circulation and patterns of use. For Kanvinde these elements formed the basis of the generic factory prototype or “total solution”. Such systematic approach, he suggested, was appropriate for two reasons: firstly, it met the highly technical nature of the milk factory production process and secondly it facilitated the post-independence demand for large-scale and rapid factory development.²⁴ For Kanvinde such integrated prototype formed the conceptual beginning point in the creative process.

From here, Kanvinde called for the development of the prototype as a situated response:

It will not be appropriate to accept that a dairy design once prepared can be used blindly for any situation as each site condition has its peculiarities and forcing a design disrespecting the site does present problem having ultimate effect on the functioning of a dairy.²⁵

Beyond the site conditions and immediate context, Kanvinde paid respect to a broad spectrum of local variants including volume and type of milk production as well as available materials and

technologies. The ongoing potential for automatization was, for example, presented as a determinant of architectural scale and the consequent structural resolution.²⁶ In Kanvinde's argument the formal expression of milk processing factory was ultimately resolved through the adjustment of an integrated prototype to pragmatic local parameters.

“Form and Design”: as Prototype

The bulk of Kanvinde's essay was devoted to the description of the milk factory prototype as distinguished from a standard industrial building. The distinction was developed with primary reference to the process of milk production and associated services. This was described in terms of sequential spatial components comprising of “milk collection, production areas, service zones, cold storages, workers' amenities and administration”.²⁷ The increasing availability and adoption of industrial methods and technology in India could now transform the Indian dairy culture toward mass production.

With a focus on the architectural implications Kanvinde envisioned this industrial process as a spatial diagram. Invested here were four architectural priorities. First was an integration of topography with the process of production. As a critique of commonly used electrical “pumping system”, he argued for the use of gravity in service of milk movement.²⁸ Whether as found or constructed, the sectional organisation was thus charged with the potential for energy efficiency. Second was a re-conception of the prevailing ventilation methods. In Kanvinde's view ventilation through exhaust fans failed to dispel the extreme odour and heat build-up that was particular to the milk production process and of critical concern in India's hot climatic regions. With the human comfort and economics of production in mind, he proposed a radical amplification of exhaust system in both scale and method. This required a regularised sequence of vertical convection cooling ‘ducts’ across the production platform. Third, a regular structural grid was proposed as an integrative framework; and finally, a circulatory order where both human and material movement were clearly registered.²⁹ Collectively these constitutive elements read as an organic, loosely modular, entity capable of adjustment to both the demands of production and contextual particularities. As an illustration of this particularisation process Kanvinde turned to his first milk factory project, the Dudhsagar Dairy at Mehsana (1970-73) in north Gujarat. Despite two decades of experience with factory design, this early work remained a poignant example of his method.

“Form and Design”: Local Translation

A functional diagram formed the basis of the Mehsana Dairy plan.³⁰ This was resolved as series of modular units, each based on an expandable seven metre square grid. Arranged in a linear order, the layout as well as the network for human and material circulation was broadly rational and followed the logic of production: beginning with milk delivery through to a multistage processing sequence and culminating in packaging and dispatch. The readily available technology of in-situ reinforced concrete frame and brick infill was used throughout and defended in practical terms. In Kanvinde's description, the brick and concrete technology was presented as locally mainstream and therefore an economical decision. He further justified the choice in relation to the program. In his view the robust and unadorned material palette provided a hygienic setting for the moist environment of milk production.³¹

Where this apparently generic layout gained specificity, was in the sectional strategy which relied on two key moves. First the linear process of production was mapped onto the gently sloping project site and resolved as an upper delivery deck and lower level processing platforms - a stacking system that allowed for milk transfer via gravity feed. Next, he extruded the functional units which in their adjacency created an undulating ensemble. The strategy not only integrated the existing landscape and production line, but further resolved the factory as a constructed topography.

This effect was then amplified by a network of vertical ventilation shafts that punctuated the perimeter of individuated volumes. The architectural form was thus resolved as an interwoven lattice of

horizontal and vertical passive environmental system that together resembled a hill-town landscape. Approached from a distance the project appeared as an abstracted monumental landmark in the relatively flat featureless landscape; a distinct image, memorable.



Figure 2 (left). Kanvinde, Dudhsagar Dairy, Mehsana (1970-73), Lattice of ventilation shafts and production units. [Photograph by author, 2011]. **Figure 3 (right).** Kanvinde, Dudhsagar Dairy, Mehsana (1970-73), Topographic composition. [Photograph by author, 2011].

Among Kanvinde's masterworks, it is no surprise that the Dudhsagar Dairy at Mehsana has consistently elicited comparisons with Kahnian tropes, in particular the compilation of architectural form in terms of 'served' and 'servant' spaces. The most direct reference has been the soaring ventilation shafts, a seemingly direct citation of Kahn's Richards Medical Laboratories at the University of Pennsylvania. The material palette of masonry and concrete as well and the elemental and abstract monumental composition have also been described as evocative of a Kahnian sensibility. When asked about such resonances, Kanvinde was cautious. Despite his huge admiration for Kahn and acknowledgment of Kahn's influence, he underlined a differentiation:

So my design of the Mehsana Dairy anyway can be related to Kahn's Medical Laboratories in Philadelphia. But those services are something else...I have a great admiration for Kahn, but I was not consciously copying him...My building is a complete fabric of usable space and ventilation systems.³²

Kanvinde's distinction here relied on the conception of the architecture as "complete fabric", or a reiteration of his earlier expression of "total solution". His deviation from Kahn thus appeared to rest on an argument for an integrated architectural system. While at Mehsana, the plan reflects a grouping of service and circulatory elements, the logic of 'served' and 'servant' spaces is not rigorously followed. Kanvinde's emphasis here was rather on an expandable and flexible architectural order with a modular grid-based organisation. Amongst a host of other services inherent to milk-processing, Kanvinde chose only to articulate ventilation shafts as individuated elements. These shaft units were neither inscribed in the "open-plan" factory nor were they grouped with other services, but instead were "plugged-in" to the structural framework. This was in effect a creative synthesis of Kahnian formal elements with a system-based organisation.

“Form & Design”: Shifts in Meaning

Notwithstanding both architects' description of their design method as the reconfiguration from a generic architectural model to a specific and highly localised architectural solution, their formulation of the terms “Form” and “Design” appear discrete. Whereas for Kahn the term “Form” was associated with an abstract order derived from ancient sources, Kanvinde resisted a historical beginning point. The distinction is important. In Kahn's self-described process and in the critical interpretations that followed, contemporary factors such as new technologies and new patterns of use allowed the modern translation of historical models. Kahnian tropes or aphorisms such as ‘served’ and ‘servant’ spaces or the “hollow stones” have thus been commonly framed as a contemporary reinterpretation of a humanist, room-based architectural order. Kanvinde on the other hand found historical grounding in the program itself. While built precedents from India's rich architectural heritage had been critical to his earlier projects such as the Indian Institute of Technology, Kanpur, his discourse on the milk factory building remained more singularly focused on the contemporary situation. If Kahn's process reinvented ancient ruins as modern buildings, Kanvinde's sought to invent both a new factory prototype and its contextual realisation. With the rational and yet highly specific requirements of milk factory production as a departure point, Kanvinde's conception of the term can thus be read as both the diagrammatic prototype for this emergent building type as well as its localised manifestation. If for Kahn the program was an agent for adjustment, in Kanvinde's work the architectural program was the formal determinant.

With this distinction in mind Kanvinde's emphasis on a “total solution” captures an alternative emphasis than posed by Kahn. Disengaged with the postwar revisionary turn to history, Kanvinde reframed his early modernist priorities in light of the late twentieth century interest in integrated networks. Whether via the mat-urbanism of the late 60s or the Metabolist structures, Kanvinde's search for a new institutional building type was system based. This was not an uncritical embrace of modern technology nor a phenomenological regionalism, but an argument for localisation tied to site, passive environmental control and the White Revolution's progressive ideals. If for Kahn the design process began with shared symbols, Kanvinde sought to invent a new, ahistorical, national emblem.

Endnotes

¹ A prominent early essay reviewing Kanvinde's built work up to 1985 was by Peter Serenyi, "Ethics and Aesthetics: An Architect and His Values", *Architecture and Design* 1, no. 4 (May-June 1985): 15-28. Other significant sources include Vikram Bhatt and Peter Scriver, *After the Masters: Contemporary Indian Architecture* (Ahmedabad: Mapin Publishing Pvt. Ltd., 1990), 14; Sarbjit Bahga, Surinder Bahga, and Yashinder Bahga, *Modern Architecture in India: Post-Independence Perspective* (New Delhi: Galgotia Publishing Company, 1993) 10-11; Jon T. Lang, Madhavi Desai, and Miki Desai, *Architecture and Independence: The Search for Identity - India 1880 to 1980* (Delhi, New York: Oxford University Press, 1997) 208, Kazi Khaleed Ashraf and James Belluardo, eds., *An Architecture of Independence, The Making of Modern South Asia: Charles Correa, Balkrishna Doshi, Muzharul Islam, Achyut Kanvinde* (New York: The Architectural League of New York, 1998), 69-78. For a recent excellent addition to scholarship on Indian architecture see Peter Scriver and Amit Srivastava, *India, Modern Architectures in History* (Chicago: Reaktion, 2015).

² In 1955 Achyut Kanvinde established his private practice in New Delhi in partnership with civil engineer Shaukat Rai and was later (1968) joined by architect Murad Chowdhury. The firm "Kanvinde, Rai and Chowdhury" completed over four hundred projects of which Kanvinde is singularly credited with over one hundred projects. See chronology in the recent monograph: Tanuja & Sanjay Kanvinde, *Achyut Kanvinde: Akar* (Delhi: Niyogi Books, 2016), 412-39.

³ Kanvinde, "Form and Design: Milk Processing Plants", in *Kanvinde Article File* (Delhi: Kanvinde, Rai and Chowdhury, 1991, unpublished article).

⁴ Kanvinde's key written works were examined in a recent study by Prajakta Sane, "Modern Temples for Post-Independence India: The Institutional Architecture of Achyut Kanvinde" (PhD diss., University of New South Wales, 2016).

⁵ Some prominent essays include Achyut Kanvinde, "Regional Housing Traditions in India", *The Architectural Review* 150 (1971); "Architecture: Absorption and Evolution", in *Independent India: The First Fifty Years*, ed. Hiranmay Karlekar (Delhi: Oxford University Press and Indian Council for Cultural Relations, 1998), 476-; for published interviews see, "Doyan [sic] of Indian Architecture: An Interview with M.N. Ashish Ganju", in *Vistara*, ed. Carmen Kagal (Bombay, Tata Press Limited: The Festival of India, 1986), 228-31; Narendra Dingle, *Dialogues with Indian Master Architects* (Mumbai: Marg, 2015) 13-37. A few of Kanvinde's essays and anecdotes are republished in the two recent monographs: Sharveya Dhongde and Chetan Sahasrabudhe, eds., *Achyut Kanvinde* (Pune, India: BNCA Publication Cell, 2009) 94-105; Tanuja & Sanjay Kanvinde, *Achyut Kanvinde: Akar*, 353-57.

⁶ Achyut Kanvinde, "Opening Remarks by the Convener", in *Seminar on Architecture* (New Delhi: Lalit Kala Akademi, Jaipur House, March 1959), 12-14; A. P. Kanvinde and H. James Miller, *Campus Design in India: Experience of a Developing Nation*, sponsored by United States Agency for International Development (Manhattan, Kansas, U.S.A.: Kansas State University, 1969).

⁷ See for instance, "Presidential Address by Achyut P. Kanvinde", *Journal of the Indian Institute of Architects*, July-September (1974): 17-20.

⁸ Achyut Kanvinde, "Quest for Quality in Architecture and Urbanisation", *Journal of The Indian Institute of Architects* 66, 4 (2001): 5-8.

⁹ Some prominent dairies designed by Kanvinde include the Sabarkantha Dairy (1975) and Banaskantha Dairy (1975) in Gujarat, Ajmer Dairy (1975) and Jaipur Dairy (1980) in Rajasthan, Mother Dairies for the four metropolitan cities (1975 onwards), Amul Dairy, Anand (1995) etc.

¹⁰ Kanvinde and Miller, *Campus Design in India*, 126-28.

¹¹ A. P. Kanvinde, "Obituary: Louis Kahn", *Journal of the Indian Institute of Architects* April-June (1974): 25.

¹² See for instance, Serenyi, "Ethics and Aesthetics: An Architect and his Values", 15; Kenneth Frampton, "South Asian Architecture: In Search of a Future Origin", in *An Architecture of Independence*, 11; Lang, Desai, and Desai, *Architecture and Independence*, 228.

¹³ Louis I. Kahn, "Form and Design", in Robert Twombly, *Louis Kahn: Essential Texts* (New York: W. W. Norton & Company, 2007), 63-64. (Original text from *Voice of America* – Louis I. Kahn. Recorded November 19, 1960 folder, Box LIK 53, Louis I. Collection, University of Pennsylvania and Pennsylvania Historical and Museum Commission).

¹⁴ Vincent J. Scully, *Louis I. Kahn* (New York: G. Braziller, 1962), 10.

¹⁵ Scully, *Louis I. Kahn*, 33.

¹⁶ David B. Brownlee and David G. De Long, *Louis I. Kahn: In the Realm of Architecture* (London: Thames and Hudson, 1997).

¹⁷ For a nuanced critique of Kahn's representation of his creative process in the design of the First

Unitarian Church and School design see Robin Williams, "An Architectural Myth: The Design Evolution of Louis Kahn's First Unitarian Church", (Master diss., University of Pennsylvania, 1990).

¹⁸ Jan C. Rowan, 'Wanting to Be: The Philadelphia School,' *Progressive Architecture* 42, 4 (April 1961): 130-169.

¹⁹ For a concise overview of India's dairy development see Bruce A. Scholten, *India's White Revolution: Operation Flood, Food Aid and Development* (London, New York: I.B. Tauris Publishers, 2010) 185-253.

²⁰ Kanvinde, "Form and Design", 2.

²¹ Kanvinde, 'Form and Design,' 2.

²² Most famously developed in Louis I. Kahn, "Talk at the Conclusion of Otterlo Congress", Twombly, *Essential Texts*, 44.

²³ Kanvinde, "Form and Design", 2.

²⁴ Kanvinde, "Form and Design", 3.

²⁵ Kanvinde, "Form and Design", 5-6.

²⁶ Kanvinde, "Form and Design", 8.

²⁷ Kanvinde, "Form and Design", 4.

²⁸ Kanvinde, "Form and Design", 4.

²⁹ Kanvinde, "Form and Design", 4.

³⁰ For insightful critiques of the Dudhsagar Dairy project see, Bhatt and Scriver, *After the Masters*, 28; Rebecca M. Brown, *Art for a Modern India, 1947-1980*, ed. Nicholas Thomas, *Objects Histories: Critical Perspectives on Art, Material Culture, and Representation* (Durnam & London Duke University Press, 2009), 126-27, Scriver and Srivastava, *India*, 228.

³¹ Kanvinde, "Form and Design", 6-7.

³² Achyut Kanvinde, "Interview by Ram Paradkar", (Pune: Transcribed from audio recordings in the private collections of Paradkar, 1994-1998).